

situation. A remarkable case of this kind has been related by M. Cruveilhier, who was invited to see an infant just born presenting a complete case of ectopia of the heart. He says: "On examining the heart thus exposed, both sounds were distinctly heard over the base, and *not* at the apex."

Lastly, the author has submitted the problem to the test of experiment, and finds that sounds resembling the first and second sounds of the heart can be produced artificially in accordance with his view. A sheep's heart is carefully prepared, and fitted with gutta-percha tubes for inlet and outlet, respectively, of water. If the ventricle be filled from the former, fitted into the left auricle, the water passes into the ventricle, and thence into the aorta, and finally rests upon and closes the aortic valves. If the ventricle be now compressed rhythmically in imitation of systole, and allowed to relax in imitation of diastole, a sound closely resembling the first sound of the heart is produced when the water is propelled from the ventricle into the tube fitted into the aorta; and another sound closely resembling the second sound of the heart is produced when the sigmoid valves close under the superincumbent weight of water in the aortic tube. As the fluid rises in the aortic tube, which is made three feet long, the pressure on the valves increases and the sound becomes more marked; when the fluid, on the other hand, diminishes, the sound becomes less distinct. The terminal piece of small diameter of a binaural stethoscope gently placed over the aorta at its commencement is most suitable for observing the cardiac sounds in this experiment.

It thus appears that the sounds of the heart are both produced at the same point—that is, at the semi-lunar valves; and each of them by its own single and simple agency.

Sir Richard Quain was moved to undertake and continue this inquiry by a desire to obtain a solution of what seemed to be an insoluble problem, and also by a belief that a correct explanation of the first sound of the heart would be of practical value in the study of the clinical phenomena of diseases of this organ. If the explanation given by him is so different from that hitherto accepted as to be calculated to create difficulties in the diagnosis of valvular diseases of the heart, closer consideration will show that this is not the case, but that, like all accurate knowledge, it simplifies and does not confuse. It affords an explanation of the relations of certain morbid phenomena which are at present unintelligible, such, for example, as that a systolic murmur may be heard at the apex, whilst the first sound is audible at the base free from murmur; and it will serve to encourage a closer study of the relation between muscular contraction of the walls of the heart and the tension of the vessels of the system.

THE DIVINING ROD.¹

IT is certainly advisable to inquire into the foundation of all popular beliefs. In some cases popular feeling, or superstition—call it what you will—has undoubtedly led to the discovery of truths not at first understood or accepted by men of science. As, for instance, the danger in the proximity of the barberry-plant to crops of corn; a danger well known, though unexplained until the microscope was used to trace out the life-history of the minute organism which causes the mischief. On the other hand, careful and unprejudiced inquiry may prove the utter baselessness of some universally accepted belief. We have an instance of this in

¹ "On the So-called Divining Rod, or *Virgula Divina*: a scientific and historical research as to the existence and practical value of a peculiar human faculty, unrecognised by science, locally known as dowsing." By Prof. W. F. Barrett. (*Proc. Soc. Psychical Research*, part xxxii., vol. xiii. July, 1897.)

the statistical inquiry into the connection between the changes of the moon and of the weather. Such a connection is apparently taken for granted by every sailor and farmer; yet a careful analysis of the records shows that the belief is entirely groundless. We are inclined, therefore, to welcome a scientific investigation into the common use of the divining rod for the purpose of finding water or metallic ores.

Turning to the paper of 280 pages which forms the text of this article, we must confess to a feeling of considerable disappointment at the way in which the subject has been treated. What are the points at issue? And what should be the method adopted? Before entering into these questions it may be well to explain in a few words what is the "divining" or "dowsing" about which so much has been written. Here we can recommend Prof. Barrett's paper. He gives a lucid account of the process, clearly distinguishing between the instruments used, which he explains are evidently of no importance whatever, and the physical or mental state of the operator, which is the matter of real moment.

"Divining" or "dowsing" is a method of finding hidden springs or ores by the employment of persons supposed to possess a peculiar faculty not common to mankind in general. This faculty takes the form of a special sensitiveness which causes a forked hazel-twig, or other pointer, held in the hands, to point downward, or upward, when the operator is vertically over the thing sought for. The pointer is a mere "autoscope;" for one dowser used a watch-spring, another a German sausage, and others go with nothing in the hands. The twitching of the rod is, as Prof. Barrett points out, a mere indication of a muscular disturbance, not otherwise very obvious. In the search for water the usual method of divining is for the operator to walk across the ground, rod in hand, stopping at points where involuntary movements cause the rod to turn. At these spots he considers that water is to be found, and he will often go so far as to state the amount that a well sunk there will yield, and the depth at which the spring will be struck. We refer specially to the discovery of water; but the same method is used for the discovery of ores, and sometimes for the tracking of criminals, the feeling responding only, so it is said, to the presence of the particular object for which search is being made.

Two hundred pages of the paper before us are devoted to an "Examination of Evidence," or rather to records of the employment of diviners for the discovery of hidden springs. To this section we will now turn. It is obviously impossible within the limits of this article to analyse the mass of evidence. The difficulty of obtaining trustworthy information as to depth of wells, level of springs, yield of water and other circumstances is very great. Even where no personal feeling enters into the question, the details supplied need the most careful sifting. All we can here do is to take some one district, and see how far Prof. Barrett's records correspond with memoranda of our own, made in the course of a geological examination of the same area. Our notes were taken simply for the purpose of obtaining details of the strata, not to prove or disprove any theory.

Two wells are mentioned as sunk in the Isle of Wight under the advice of a diviner, both counting as successes. As to the first, at Arreton, we are only given the diviner's own uncorroborated account, and not knowing the exact site of his well it is impossible to form an opinion about it. At the other place mentioned, a house called Woodside, at Wootton, near Ryde, two wells had been sunk, under whose advice we know not, in the Oligocene clays, and, of course, they yielded no water. The diviner afterwards selected a site a few yards further south, on the edge of the sheet of plateau gravel which supplies water to all the farms and houses over its area. It did not need a diviner to give this advice; any cottager

would have given the same, and water was obtained within seven feet of the surface.

These two successes are the only instances mentioned for the Isle of Wight. We, however, can give four others, all of which were failures. Happening to be at Wootton we came across three other wells being dug under the advice of the diviner—whether the same person as operated at Woodside we do not know. We watched the sinking with great interest, for they were all in strata which a geologist could not advise sinking into, and consequently could seldom examine. Each of the wells was abandoned long before the first water-bearing stratum was reached. In fact, an additional depth of fully two hundred feet would be needed to reach the first spring, and then the supply would be but small and the water bad. A fourth site selected by the diviner was in chalk close to the sea. Some months afterwards a geologist was consulted, and he had to advise that nothing but salt water could be obtained there. The fact that a diviner had previously been consulted was only made known to the geologist by an accident. Thus, instead of the Isle of Wight yielding two successes and no failures, it yields four failures, one success—one that did not need a diviner, and one which, on the diviner's testimony alone, counts as a complete success.

This brings us to the principal criticism that we have to make on Prof. Barrett's collection of facts—that he does not give enough weight to the natural tendency of mankind to conceal their failures. A man making a bet or speculation is inclined to boast of it if it is a success. But if it fails, he usually prefers to hold his tongue. It is much the same with divining. It is perfectly natural that both the diviner and his employer should wish to keep the failure secret.

Though the bulk of the paper is taken up with hearsay evidence, we are given two fairly satisfactory test cases, which should be noted by any one who, on the strength of the numerous reports, is inclined to employ a diviner. One of the cases we allude to is the careful trial made in the adits at Richmond Waterworks, in Surrey. Two diviners were employed independently to locate the springs; with the result that they did not agree, and that when borings were made at the spots indicated, most of them were failures. In another case, Prof. Barrett himself tested the powers of a diviner, who was said to have been highly successful elsewhere in finding both water and ores. In Prof. Barrett's hands he failed completely, though an expert thought-reader might have had fair success. The diviner in this case seems to have been accompanied by persons having a complete knowledge of the position of all the springs, wells, and pipes which the dowser failed to find.

If scientific men still think it worth while to spend time on this investigation, we would suggest certain precautions which must be taken before any results can be accepted. Hearsay evidence, like the bulk of that brought forward, is valueless. When the skill of the dowser is tested, it must be at a place where surface indications will not help. Before boring or sinking the dowser's report must be put into writing, and no additions to his prophecy should afterwards be accepted. The operator should not be accompanied by any one who knows the position of the springs or pipes which he is set to find. His companion should be a stranger who can note the exact spots chosen, and write down at the time the exact nature of the diviner's forecast. The depth to the spring, amount of water expected, and continuous or temporary yield should all be noted. It should be carefully recorded whether the diviner predicts an open fissure, which can be tapped by boring, or advises a sunk well to collect a percolating supply. This last precaution is a very necessary one, for it constantly happens that a small boring, with an area of perhaps ten square inches, misses a fissure, or penetrates

it at a spot where the walls come together. On the other hand, a sunk well would have a superficial area of some 4000 square inches, and consequently have a far better chance of obtaining water.

One of the most satisfactory tests would be to set the diviner to map out in some clay district the intricate network of water-pipes and drains of an unknown town. Or, if he prefers still water, to hide a number of bottles, some full and some empty, under a cloth or board, and let the dowser select the full ones without touching or seeing any of them. After shifting the bottles a few times this ought to give a sufficiently large number of tests to enable the percentage of failures to be calculated. But here again there must be no one in the room who knows the position of the bottles.

In conclusion, we must express our opinion that this investigation, undertaken at the request of the Council of the Society for Psychical Research, leaves the question in the same state as it found it. We feel that the accumulation of second-hand evidence is of little use, and that what is wanted is a few careful tests by perfectly qualified and unbiassed observers. The Richmond inquiry was good, but the failure is explained away by the statement that the dowers employed were not in the first rank, and were young and inexperienced. Unfortunately all the most successful prophets seem to be dead.

NOTES.

THE American Geographical Society has guaranteed Lieut. Peary the sum of 150,000 dollars to meet the expenses of his proposed Arctic expedition. Lieut. Peary has obtained five years' leave of absence, and will start upon his journey about the end of next July. The large meteorite he succeeded in obtaining during the expedition which returned to St. John's, Newfoundland, towards the end of last month, weighs over seventy tons, and is to be placed in the New York Museum of Natural History.

It is announced that Prof. Sanarelli, director of the Montevideo Institute of Experimental Hygiene, who recently discovered the bacillus of yellow fever, has now succeeded in preparing a curative serum. The details of the discovery will shortly be published.

Science states that Prof. Michael Foster will deliver several lectures in Baltimore in the course of this month, and will visit Boston later to deliver a course of lectures at the Lowell Institute.

DR. FRANK CLOWES has been appointed chemist to the London County Council, in succession to Mr. W. J. Dibdin, who recently resigned the post.

THE Agricultural Committee of the University College of North Wales, Bangor, has acquired a large farm in Anglesey, near Llangefni, for the purpose of providing practical courses of instruction in agriculture, together with field experiments. It is noteworthy that the same site had been previously used for agricultural work, conducted under the auspices of the college long before the present proposal was contemplated.

AT the meeting of the London County Council on Tuesday, the following resolution was adopted:—"That it be referred to the Parks and Open Spaces Committee and to the Technical Education Board to consider and report upon the practicability of laying out plots of ground in certain parks in such manner as will afford assistance to scholars of elementary and secondary schools in the study of practical botany."

THE opening meeting of the new session of the Royal Photographic Society was held on Tuesday evening, the Earl of Crawford, president, being in the chair. The proceedings